

REMARKS/ARGUMENTS

Claims 1-11 were previously pending in the application. New claims 12-17 are added herein. Support for new claims 12-17 is found in original claims 2-7, respectively. Assuming the entry of this amendment, claims 1-17 are now pending in the application. The Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

On page 3 of the office action, the Examiner rejected claims 1-7 under 35 U.S.C. 102(e) as being anticipated by Cao. On page 7, the Examiner rejected claims 8-11 under 35 U.S.C. 103(a) as being unpatentable over Cao in view of Battou. For the following reasons, the Applicant submits that all of the now-pending claims are allowable over the cited references.

Claims 1 and 9

Claim 1 is directed to a method for determining a restoration path corresponding to a primary path for a new service in a mesh network having a plurality of nodes interconnected by a plurality of links. According to the recited method, a path cost is generated for each of a plurality of candidate restoration paths associated with the new service, and the restoration path for the new service is selected based on the path cost for each candidate restoration path.

The path cost for a candidate restoration path is generated by:

- (1) determining, for each link Li of one or more links in the candidate restoration path, a set $B-Li$ -set of links protected by link Li ;
- (2) determining, for each link Li , a set $I-Li$ -set of links in the set $B-Li$ -set that are also in the primary path;
- (3) calculating, for each link Li , a link cost $Cost_Li$ based on the set $B-Li$ -set and the set $I-Li$ -set; and
- (4) calculating the path cost based on a sum of the one or more link costs $Cost_Li$.

For the following reasons, the Applicant submits that Cao does not teach such a combination of features.

In paragraphs [0035]-[0054], Cao discloses a path computation algorithm for provisioning a new service in a mesh network, where Steps 1-3 compute and provision an active working path (i.e., primary path) for the new service, and Steps 4-8 compute and provision a backup path (i.e., protection path) for the new service. Significantly, however, Cao's method does not (1) generate a path cost for each of a plurality of candidate restoration paths associated with the new service, using the technique explicitly recited in claim 1, and (2) select the restoration path for the new service based on the path cost for each candidate restoration path.

In particular, in Step 1, Cao filters out all links in the network that have residual bandwidth (RC_i) less than the bandwidth β of the new service. In Step 2, using the remaining links in the network, Cao identifies the active working path "based on a plurality of criteria such as the minimal cost, or by considering the risks associated with each link in the remaining graph." In Step 3, Cao attempts to set up

the active working path. If the attempt is not successful, then processing returns to Step 1 to find a different active working path. If the attempt is successful, then processing proceeds to Step 4.

In Step 4, Cao filters out certain links in the network from further processing. In Step 5, Cao computes a link cost for each remaining link in the network. In Step 6, Cao identifies, if possible, the backup path by computing "the minimal cost path as the backup path." In Steps 7 and 8, Cao attempts to reserve the backup path. If the attempt is not successful, then processing tries to find a different backup path and, failing that, processing returns to Step 1 to try to find a different active working path. If the attempt to reserve the backup path is successful, then processing is completed.

As an initial matter, the Applicant submits that the disclosure in Cao is either wrong or indefinite. For example, paragraph [0043] contains the equation " $\Pi \cap \Omega_i \neq \Phi$," where the shared risk set Π for the active working path is defined in paragraph [0040] as "the union of Ω_i associated with each of these k links," referring to the k links in the active working path, and Ω_i is defined in paragraph [0023] as the shared-risk link group (SRLG) associated with link i.

The Applicant notes that the symbol " Φ " is not defined in Cao. The Applicant believes that the instances of the symbol " Φ " in Cao resulted from typographical errors. The Applicant believes that the symbol " Φ " in Cao should have been the symbol " \emptyset ," which represent the null set.

For example, in paragraph [0043], Cao is describing a step of eliminating certain links in the network from further processing "to ensure the backup path and the active working path share no common risk." To achieve that goal, Cao teaches "filtering all the links i if the following is true:

$\Pi \cap \Omega_i \neq \Phi$." This filtering step makes sense if the logic condition in paragraph [0043] were written as " $\Pi \cap \Omega_i \neq \emptyset$." Otherwise, the logic condition in paragraph [0043] does not make any sense, since the set symbol " Φ " is not defined anywhere in Cao. Nor would Cao's explicitly stated goal of ensuring that the backup path and the active working path share no common risk be achieved if the logic condition were not corrected.

Similarly, the Applicant believes that the symbol " Φ " appearing in the logic of paragraphs [0045], [0048], and [0075] should also be corrected to be the null set symbol " \emptyset ." Again, without these corrections, the logic of those paragraphs does not make any sense.

Even with those corrections, for the following reasons, the Applicant submits that Cao does not teach or even suggest the invention of claim 1.

In rejecting claim 1, on page 3, the Examiner cited:

- o Cao's set Ω_i as an example of the set *B-Li-set* of claim 1; and
- o Cao's set Ψ_i as an example of the set *I-Li-set* of claim 1.

The Applicant submits that this constitutes a mischaracterization of the teachings in Cao.

According to claim 1, *B-Li-set* is the set of links protected by link *Li*, and *I-Li-set* is the set of links in the set *B-Li-set* that are also in the primary path. Cao teaches that Ω_i is the SRLG set associated with link i (see paragraph [0023]), while Ψ_i is defined as the union of the SRLG set associated with each of the k paths that are protected using link i. Thus, while it may be true that Cao's set Ω_i is an example of the set *B-Li-set* of claim 1, it is simply not true that Cao's set Ψ_i is an example of the set *I-Li-set* of claim 1.

Cao's set Ψ_i is the union of the SRLG sets associated with all k paths that are protected using link i. For example, if link i is used to protect k=10 different primary paths, where each link in each of those ten different primary paths has an SRLG set, then Ψ_i is the set of links corresponding to the union of all of the links in those different SRLG sets for all of those different links in those 10 different primary paths.

On the other hand, the set *I-Li-set* of claim 1 is explicitly defined in claim 1 as being the set of links in the set *B-Li-set* that are also in the primary path. In other words, the set *I-Li-set* is the set of links protected by link Li (i.e., *B-Li-set*) that are also in the primary path. This is very different from Cao's set Ψ_i .

In the network partially represented in Fig. 17 and described on page 42 of the present specification, the exemplary new primary path contains links L1 and L2, while link L3 is described as already providing protection for links L1, L8, and L10 (where links L8 and L10 are explicitly identified as being in the network but just not shown in the partial representation of Fig. 17). In this example, the set *B-Li-set* for link L3 contains links L1, L8, and L10. As such, the set *I-Li-set* for link L3 contains only link L1, because link L1 is the only link in the set *B-Li-set* for link L3 that is also in the new primary path (consisting of links L1 and L2).

On the other hand, Cao's set Ψ_i would be the union of the SRLG sets associated with all of the primary paths that are protected using link L3. As best understood by the Applicant, since link L3 provides protection for links L1, L8, and L10, Cao's set Ψ_i would include (at least) these three links.

Clearly, Cao's set Ψ_i is not an example of the set *I-Li-set* of claim 1. As such, Cao cannot be said to teach the step of determining a set *I-Li-set* for each link Li of each of a plurality of candidate restoration paths.

Furthermore, since Cao does not teach or even suggest the set *I-Li-set*, Cao cannot be said to teach or even suggest the step of calculating a link cost *Cost_Li* based on the set *B-Li-set* and the set *I-Li-set*.

The Applicant submits that the Examiner's rejection of claim 1 was based on mischaracterizations of the teachings of Cao and that such rejection should be withdrawn as improper.

For all these reasons, the Applicant submits that claim 1 is allowable over Cao. For similar reasons, the Applicant submits that claim 9 is allowable over Cao. Since claims 2-8 depend directly or indirectly from claim 1, and claims 10-17 depend directly or indirectly from claim 9, it is further submitted that those claims are also allowable over Cao.

Claims 2 and 12

According to claim 2, the set *I-Li-set* is determined from an intersection of the set *B-Li-set* and a set *P-set* of links in the primary path. In rejecting claim 2, the Examiner cited Cao's equation " $\Pi \cap \Omega_i \neq \Phi$ " as an example of the recitation of claim 2.

First of all, as explained in the previous section, the Applicant believes that Cao's equation " $\Pi \cap \Omega_i \neq \Phi$ " is wrong. In fact, the symbol " Φ " should be the null set symbol " \emptyset ." With that correction, it becomes clear that Cao's equation is not a formula for calculating a set Φ . Rather, Cao's equation is a logic condition, whose truth or falseness determines whether the corresponding link i should be ignored during subsequent processing.

Furthermore, for the Examiner's rejection of claim 2 to be meaningful, the set Φ would have to be an example of the set *I-Li-set* of claim 2, and the set Π would have to be an example of the set *P-set*

of links in the primary path, since the Examiner already argued, in rejecting claim 1, that the set Ω_i is an example of the set *B-Li-set*.

First of all, the Examiner already argued, in rejecting claim 1, that Cao's set Ψ_i is an example of the set *I-Li-set*. The Examiner cannot now argue that Cao's set Φ is also an example of the set *I-Li-set*. Secondly, according to paragraph [0040], Cao's set Π is the shared risk set associated with the primary path, which is explicitly defined as being the union of associated SRLG sets Ω_i associated with the k links in the primary path. Thus, Cao's set Π cannot be said to be an example of the set *P-set* of links in the primary path. In fact, by definition, Cao's set Π does not and cannot even have any links in common with the primary path.

The Applicant submits that this provides further reasons for the allowability of claim 2 and similarly of claim 12 over Cao.

Claims 3 and 13

According to claim 3, for link Li , the link cost $Cost_Li$ is a function of whether or not the set *B-Li-set* is empty. In rejecting claim 3, the Examiner cited paragraphs [0044]-[0045] at teaching an example of the features explicitly recited in claim 3. Here, too, the Applicant submits that the Examiner mischaracterized the teachings of Cao.

According to the Examiner's rejection of claim 1, Cao's set Ω_i is an example of the set *B-Li-set*. Cao computes the link cost (i.e., $cost_i$) for link i using the logic of paragraph [0045]. Nowhere in that logic does Cao teach or even suggest determining whether or not set Ω_i is empty. As such, Cao cannot be said to teach or even suggest that a link cost is a function of whether or not the set *B-Li-set* is empty.

The Applicant submits that this provides further reasons for the allowability of claim 3 and similarly of claim 13 (and also claims 4-6 and 14-16, which depend variously from claims 3 and 13, respectively) over Cao.

Claims 4 and 14

According to claim 4, if the set *B-Li-set* is empty, then the link cost $Cost_Li$ is based on bandwidth of the new service. If the set *B-Li-set* is not empty, then the link cost $Cost_Li$ is a function of whether or not the set *I-Li-set* is empty. Here, too, the Applicant submits that the Examiner mischaracterized the teachings of Cao.

In rejecting claim 1, the Examiner argued that Cao's set Ψ_i is an example of the set *I-Li-set*. Nowhere in the logic of paragraph [0045] does Cao teach or even suggest determining whether or not the set Ψ_i is empty. At most, Cao determines whether or not $(\Pi \cap \Psi_i)$ is empty, but this is simply not the same thing as determining whether or not the set Ψ_i is empty. As such, Cao cannot be said to teach or even suggest that a link cost is a function of whether or not the set *I-Li-set* is empty.

The Applicant submits that this provides further reasons for the allowability of claim 4 and similarly of claim 14 (and also claims 5-6 and 15-16, which depend from claims 4 and 14, respectively) over Cao.

Claims 5 and 15

According to claim 5, if the set *I-Li-set* is empty, then the link cost $Cost_Li$ is based on a difference between the bandwidth of the new service and bandwidth currently reserved on the link Li . If

the set *I-Li-set* is not empty, then the link cost *Cost_Li* is based on a difference between (a) a sum of the bandwidth of the new service and maximum service bandwidth protected by link *Li* for all links in the set *I-Li-set* and (b) the bandwidth currently reserved on the link *Li*. Here, too, the Examiner has mischaracterized the teachings in Cao.

As best understood by the Applicant, the Examiner argued that:

- o Cao's formula " $AC_i = AC_i + \beta$ " in paragraph [0041] is an example of "a sum of the bandwidth of the new service and maximum service bandwidth protected by link *Li* for all links in the set *I-Li-set*" as recited in claim 5; and
- o Cao's TC in paragraph [0022] is an example of "the bandwidth currently reserved on the link *Li*" as recited in claim 5.

The Examiner is wrong in both instances.

First of all, since β is clearly defined, in paragraph [0036], as being the bandwidth of the new service, in order for the Examiner's rejection of claim 5 to make any sense, AC_i would have to be an example of "maximum service bandwidth protected by link *Li* for all links in the set *I-Li-set*." However, in paragraph [0024], Cao explicitly defines AC_i as the bandwidth in link *i* that is allocated to the active working paths. In fact, Cao's AC_i has nothing to do with bandwidth reserved for restoration paths. As clearly described in paragraph [0041], Cao's formula " $AC_i = AC_i + \beta$ " relates to the update of the bandwidth in link *i* that is allocated to the active working paths when the new active working path is set up. This formula has nothing to do with the reservation of bandwidth for restoration paths. Thus, Cao's formula " $AC_i = AC_i + \beta$ " in paragraph [0041] cannot be an example of "a sum of the bandwidth of the new service and maximum service bandwidth protected by link *Li* for all links in the set *I-Li-set*."

Furthermore, in paragraph [0022], Cao explicitly defines TC_i as the total bandwidth of link *i*. As such, Cao's TC_i cannot be said to represent the bandwidth currently reserved on the link *Li*.

The Examiner also appeared to cite Cao's formula " $TC_i - AC_i - BC_i$ " as being equal to the difference between items (a) and (b) of claim 5. For the Examiner's rejection to be logically consistent, Cao's formula " $TC_i - AC_i - BC_i$ " would have to be equal to the difference between Cao's " $AC_i + \beta$ " and Cao's TC_i . In order for that to be true, Cao's BC_i would have to mean the same thing as Cao's β . But that is simply not true. As explained above, Cao's β is the bandwidth of the new service, while, in paragraph [0025], Cao explicitly defines BC_i to be the bandwidth of link *i* reserved for the backup paths.

The Applicant submits that this provides further reasons for the allowability of claim 5 and similarly of claim 15 over Cao.

Conclusion

For the reasons set forth above, the Applicant respectfully submits that the rejections of claims 1-11 under Section 102(e) have been overcome. Furthermore, new claims 12-17 patentably define over the cited references.

In view of the above amendments and remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Fees

During the pendency of this application, the Commissioner for Patents is hereby authorized to charge payment of any filing fees for presentation of extra claims under 37 CFR 1.16 and any patent

application processing fees under 37 CFR 1.17 or credit any overpayment to Mendelsohn & Associates, P.C. Deposit Account No. 50-0782.

The Commissioner for Patents is hereby authorized to treat any concurrent or future reply, requiring a petition for extension of time under 37 CFR § 1.136 for its timely submission, as incorporating a petition for extension of time for the appropriate length of time if not submitted with the reply.

Respectfully submitted,

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